which the DNA translates that code and orchestrates the growth of a complex fleshy animal (with hundreds of distinct tissues, organs, and systems) is only now becoming clear, reports Gehring, professor of cell biology at the University of Basel in Switzerland.

Every cell contains "active" and "inactive" genes, Gehring notes. Scientists now believe that "master" genes—containing small segments of DNA called homeoboxes—act as virtual switches, turning whole groups of genes "on" and "off." The homeobox does this by creating protein messengers that bind with some genes, and not others. The result of this intricate process is that sets of cells end up with special genetic instructions that differentiate them from other cells nearby. Each cell group then migrates to its proper place in the growing embryo and develops into a specific body part or system.

Gehring first became aware of these special genes in 1965, while studying the developmental stages of fruit flies. Observing strange mutations—legs sprouting up where antennae should be—he and his colleagues identified a wide range of "homeotic" genes that govern the physical layout of a developing embryo. As the scientists gained a more sophisticated understanding of the chemical mechanisms underlying these unique genes, they conceived of master genes overseeing the whole developmental process. Experiments in 1983 confirmed the existence of these master genes and their homeobox mechanisms.

Do such research findings apply only to fruit flies? No, Gehring maintains. Master genes have been found in the embryos of many other vertebrates, including humans. Indeed, he notes, "the discovery of the homeobox in a wide range of species suggests that the molecular mechanisms underlying development may be much more universal than was previously suspected." However, he adds, the discovery of these controlling genes is only one piece of a terribly complicated puzzle. The biologists' next question: What regulates homeoboxes?

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San Francisco's Downtown Plan

"San Francisco's Downtown Plan: Environmental and Urban Design Values in Central Business District Regulation" by Steven L. Vettel, in *Ecology Law Quarterly* (No. 3, 1985), School of Law (Boalt Hall), Univ. of Calif., Berkeley, Calif. 94720.

Like many big American cities, San Francisco has seen its share of development in recent years, particularly of its business district. In fact, writes Vettel, an attorney in San Francisco, "the city's downtown growth rate ranks as the nation's highest."

But unlike residents in other major urban centers, Vittel contends, San Franciscans have not allowed the developers' natural desire for profits to

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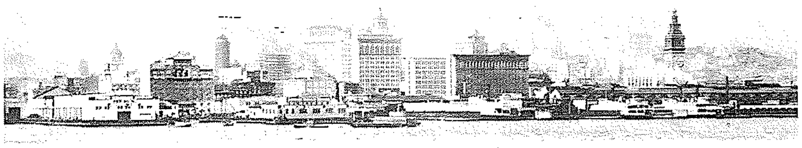
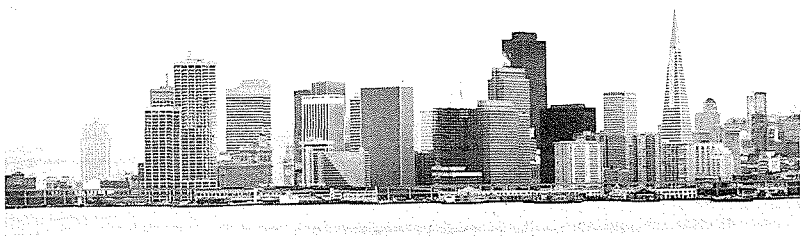


San Francisco: In 1927 (above), various beaux-arts edifices decorated the landscape. Today's skyline (below), dominated by austere, high-rise office buildings, looks to some critics like a "refrigerator showroom."



overwhelm the city's unique architectural character. In November 1984, the city's Planning Commission adopted the Downtown Plan, a strict zoning system aimed at slowing the rate of office building construction, preventing "environmentally destructive" projects from being approved, and controlling the "cumulative effects" of growth in the city.

San Francisco's building boom began during the mid-1960s and picked up speed with the passage of a $1.5 billion bond financing a mass-transit system (Bay Area Rapid Transit). As new structures such as the 43-story Wells Fargo Building (built in 1966) and the 54-story Bank of America headquarters (1969) loomed large, many city residents charged that their picturesque, hilly landscape was starting to resemble a "refrigerator showroom." The Department of City Planning set up ordinances to control the height, bulk, and density of buildings in four downtown commercial districts. It created the Landmarks Preservation Advisory Board to review construction proposals. And it utilized the strict guidelines for proposed commercial sites set by the state legislature in the 1970 California Environmental Quality Act. Despite such measures, argues Vittel, the regulations were "piecemeal" and did not form a "coherent, comprehensive package of regulatory tools."

The Downtown Plan, though, is far more comprehensive, Vittel reports. It substitutes a "mandatory formal design procedure" for the presently inconsistent and confusing "discretionary review process," which sometimes permitted the construction of undesirable projects. Some aims of the new plan: to shorten and slim down future office towers; to preserve a greater number of "architecturally significant" historic structures (about 250); to give greater consideration to public transportation and housing;

and to open up space for more public facilities, artworks, and sunlight.

Although the new guidelines are stringent, they are designed to slow, not stop, business district growth. By the year 2000, total downtown office space and employment are projected to rise by 21.7 million square feet and 91,000 jobs, respectively. The Planning Commission hopes the new rules will cut the rate of annual growth by anywhere from one-third to one-half and encourage some businesses to settle outside of the city.

Oil and Water Sometimes Mix

"Oil Pollution: A Decade of Research and Monitoring" by John W. Farrington, in *Oceanus* (Fall 1985), Woods Hole Oceanographic Institution, Woods Hole, Mass. 02543.

There are few environmental disasters that spark more public alarm than does an oil spill.

During the 1970s, a series of spectacular oil tanker mishaps—including the 1978 *Amoco Cadiz* spill off the French coast and a 1979 oil well blowout in the Gulf of Mexico—prompted environmentalists to issue dire warnings about the state of the world's oceans. But their fears, reports Farrington, a chemist at Woods Hole Oceanographic Institution, have not been realized.

In a report released last April by the National Research Council (NRC), more than 100 oceanographers offered "cautious optimism" about the ability of sea life to recover from petroleum toxicity. Underlying their rosier assessment, notes Farrington, was an "increased understanding of how the marine environment copes with oil."

Researchers now know that man is not the only one to sully the ocean with petroleum. Seepage from natural reservoirs beneath the ocean floor is also responsible, as is the erosion of sediments (such as shale) that contain petroleum-like hydrocarbons. All told, Mother Nature annually releases between 250,000 and 2.5 million tons of oil into the oceans. By contrast, man's *accidents* account for only an estimated 420,000 tons per year. A large fraction of oil pollution in the oceans, observes Farrington, can be attributed to "the chronic dribbling of petroleum from sloppy use by modern society." Municipal and industrial wastes, normal tanker operations, ships' bilges, and other non-accidental sources annually release more than 2.3 million tons.

What happens to oil in salt water? At first the two liquids do not mix, says Farrington. But over several months, the wind, waves, sun, and microorganisms gradually break down much of the petroleum mixture. Some chemical components dissolve; others evaporate. Another portion soaks into (or clings to) floating particles, which then sink to the ocean bottom. Chunks of the remaining residue end up as tar. But petroleum products can vary widely in composition, he cautions, making generalizations about their degradation troublesome: Sometimes 11 percent of the oil decomposes, sometimes 90 percent—depending on what has been added to it.

In terms of human health, the greatest threat from petroleum pollution comes from contaminated seafood, which can be laden with cancer-causing